PB86-133931

Superfund Record of Decision (EPA Region 4)
Davie Landfill, Broward County, Florida
September 1985

(U.S.) Environmental Protection Agency
Washington, DC

30 Sep 85

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-85/005
September 1985

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EPA

Superfund Record of Decision:

Davie Landfill, FL

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NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA/ROD/R04-85/005		PB86 133931/AS

4. TITLE AND SUBTITLE	5. REPORT DATE
SUPERFUND RECORD OF DECISION Davie Landfill, FL	September 30, 1985 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Same as box 12.	10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report 14. SPONSORING AGENCY CODE 800/00

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Broward County Solid Waste Disposal facility (a.k.a. Davie Landfill) is located 10 miles southwest of Fort Lauderdale, Florida near the intersection of Orange Drive and Boy Scout Road. The landfill area includes a 50-acre garbage landfill, an 80-acre trash landfill and a 56-acre sludge lagoon. The facility began operation in 1964 accepting trash and ash from the county's adjacent garbage incinerator. In November 1971, the lagoon was created in an unlined natural depression onsite. Grease trap pump-outs, septic tank and treated municipal sludges were disposed in the lagoon which contains an estimated 75,000 cubic yards of sludge. Initial sampling of the lagoon contents characterize the waste as being in the high range of typical wastewater treatment plant sludge hazardous constituents. In addition, concerns have been raised about the relatively high cyanide and sulfide concentrations detected.

The selected remedial action includes: dewatering and stabilization of the sludge lagoon contents and placement in a single-lined sanitary landfill cell; and installation of a cap on the cell that meets the regulatory requirements of 40 CFR 264.310(a). This ROD addresses only source control measures. The decision concerning cleanup of groundwater contamination will be made following an evaluation of these actions and monitoring data. Total capital cost for the selected remedial action is estimated to be $3.0-$3.7 million with annual O&M costs of $100,000.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Davie Landfill, FL Contaminated Media: gw Key contaminants: wastewater treatment plant sludge hazardous constituents; cyanide; sulfide		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
	None	28
	20. SECURITY CLASS *(This page)*	22. PRICE
	None	

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

RECORD OF DECISION
Remedial Alternative Selection

Site: Broward County Solid Waste Disposal Facility
at Davie, Florida (A.K.A Davie Landfill)

Documents Reviewed

I am basing my decision on the following documents describing the analysis of cost-effectiveness of remedial alternatives for Davie Landfill:

EPA Correspondence

Results of EPA sampling of Sludge Lagoon, EPA Athens - Sept. 9, 1982

Staff Summaries and Recommendations

FDER Correspondence

Recommendations from Florida DER

Hazen & Sawyer, P.C. Reports prepared for Broward County

Purpose and Description of Analytical Tests for Landfill Sludge Closure Project - January 27, 1983

Broward County Sludge Lagoon Sampling and Analysis Protocol - May 11, 1983

Status Summary of the Davie Landfill, Broward County - May 17, 1983

Broward County Landfill Sludge Lagoon Closure - April, 1984

Project Status Report
Appendix I (Analytical Data)
Appendix II (Analytical Data)
Appendix III (Analytical Data)

Draft Report - July, 1984

2nd Draft Report - February, 1985

Final Report - April, 1985

Additional Analytical Data for Sludge Lagoon Closure - July 11, 1985

Description of Selected Remedy

The selected remedy is:

- Dewatering and Stabilization of the sludge lagoon contents and placement in single lined sanitary landfill cell #14.
- Installation of a cap on cell #14 that meets the regulatory requirements of 40 CFR 264.310(a).

Future Actions

This ROD addresses only the source control. The decision on additional action that may be necessary to address groundwater contamination will be made after an evaluation of the effects of this action and further assessment of data from continued montoring.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have determined that stabilization of the sludge lagoon contents and placement in sanitary landfill cell #14 at the Broward County Solid Waste Disposal Facility (a.k.a Davie Landfill) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment. The State of Florida has been consulted and agrees with this action. The remedial action does not adversely affect any floodplain or wetland areas.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

Sept 30, 1985
Date

Jack E. Ravan
Regional Administrator
EPA Region IV

SITE LOCATION AND DESCRIPTION

The Broward County Solid Waste Disposal facility (a.k.a. Davie Landfill) is located 10 miles Southwest of Fort Lauderdale, Florida near the intersection of Orange Drive and Boy Scout Road. (Figure 1) The landfill area includes a 50 acre garbage landfill, an 80 acre trash landfill and a 5.6 acre sludge lagoon. The landfill is between two major drainage canals. The North New River Canal is approximately 3 1/2 miles north of the landfill and the South New River Canal is approximately 1/4 mile south of the landfill (Figure 2). The Biscayne Aquifer is approximately 100 feet thick in the vicinity of the landfill and extends from near the normal ground surface to approximately 90 feet below mean sea level. The groundwater gradient in the vicinity of the landfill is approximately 0.4 feet/mile from the northwest to the southeast; however, this gradient may be altered temporarily by water levels in the drainage canals.

The Town of Davie, located in the southwestern part of the county, has grown from 5,800 in 1970 to 20,877 in 1980 with a projected population of 37,000 for the year 2000. The residential density in Davie is fairly low, 1.25 people per acre. Surrounding the Broward County Solid Waste Disposal Facility there are approximately 5, 95, and 500 dwellings within 500, 2,500 and 5000 feet respectively. The property surrounding the site is located above the floodplain and is not in a wetlands area. (Figure 3).

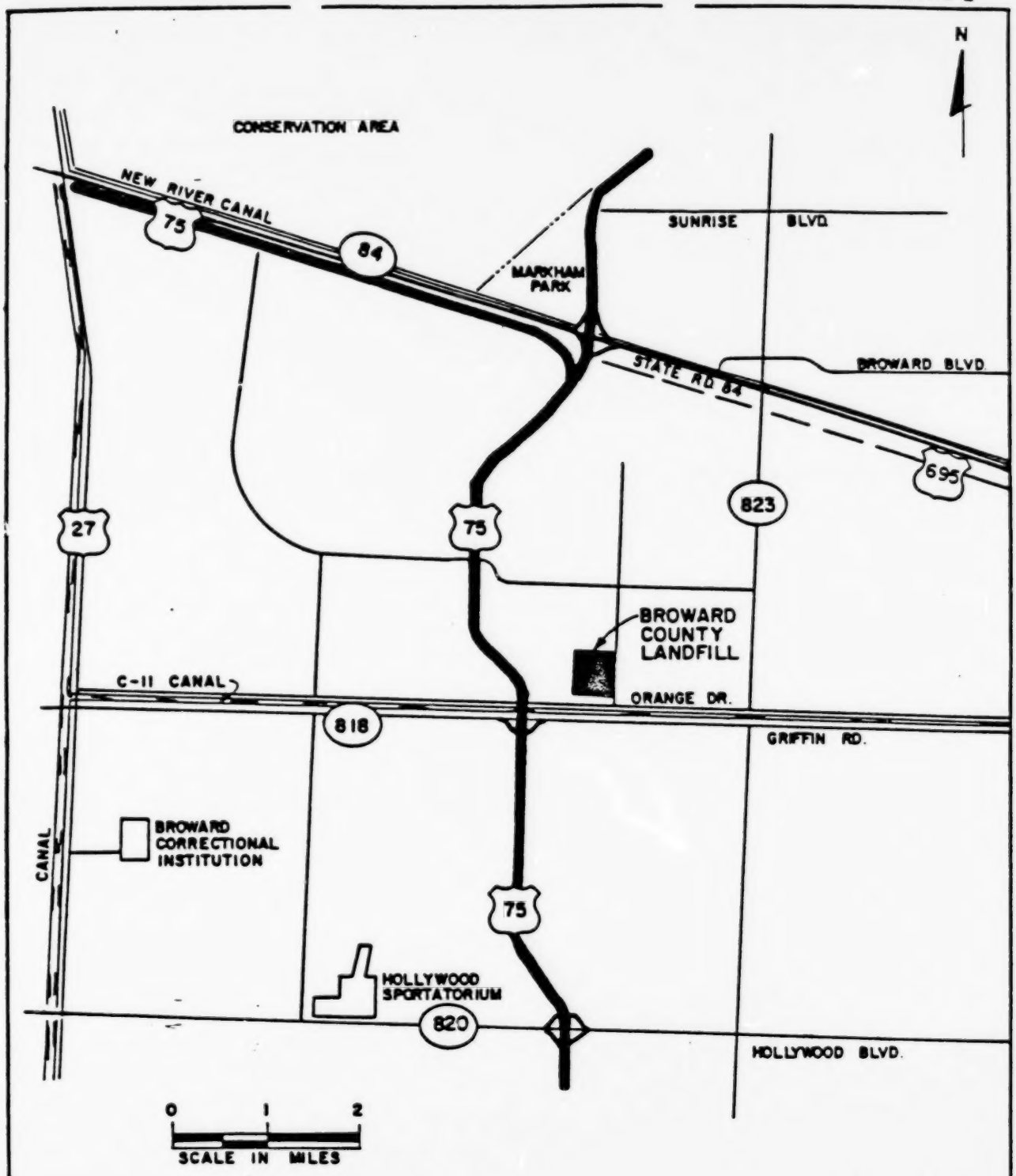
Drinking water for the residents of Davie is supplied from private wells, with the nearest well about 1700 feet from the site. The water quality is poor in this area. It has high color along with high levels of hydrogen sulfide and iron. For this reason many area residents use bottled water for drinking purposes.

SITE HISTORY

The facility began operation in 1964 to accept trash and ash from the County's adjacent garbage incinerator. In November 1971, the lagoon was created in an unlined natural depression on site and began receiving grease trap pump outs, septic tank and treated municipal sludges. In June 1975, the incinerator closed because of excessive particulate matter emissions and the sanitary (garbage) landfill opened. At this time the lagoon received an estimated 2500 tons per month of waste. In 1977, it was necessary to construct dikes around two sides of the lagoon. Later the dikes were raised and a concrete off-loading ramp built. By 1980, the volume received by the lagoon had increased to 7,100 tons per month. On several occasions leakages resulted in discharges to an adjacent borrow pit. Concern about these visible discharges and the belief that discharges were occurring both to the adjacent trash landfill and to the groundwater led the County to restrict the lagoon to grease trap pump outs in February 1980. In November 1981 all disposal at the lagoon ceased.

The 80 acre trash landfill continues in operation and is scheduled to close in 1987. The 50 acre sanitary landfill is now filling its last cell and will close in 1987. Groundwater contamination from the sludge

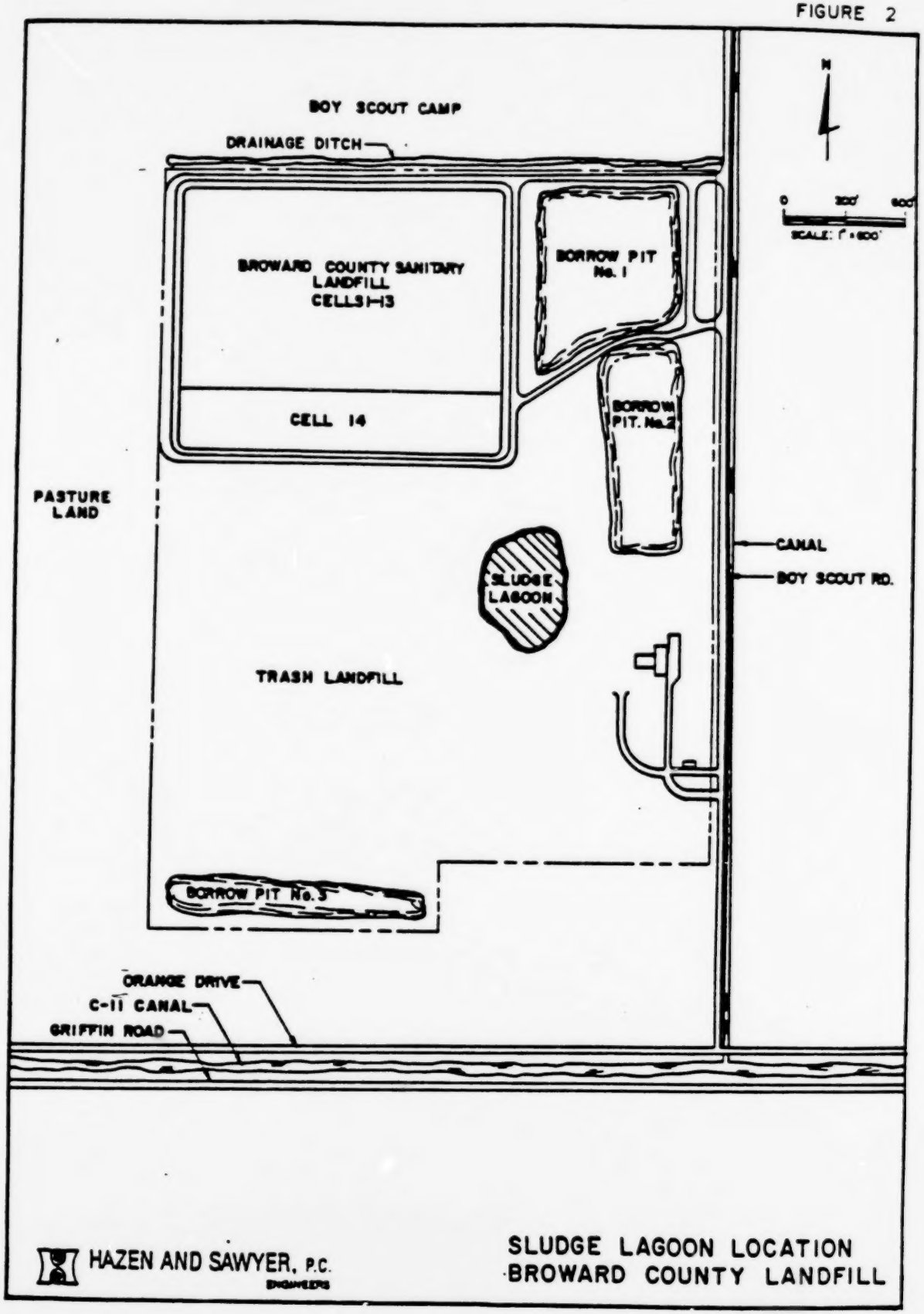
FIGURE 1



LOCATION OF
BROWARD COUNTY LANDFILL
IN THE TOWN OF DAVIE

HAZEN AND SAWYER, P.C.
ENGINEERS

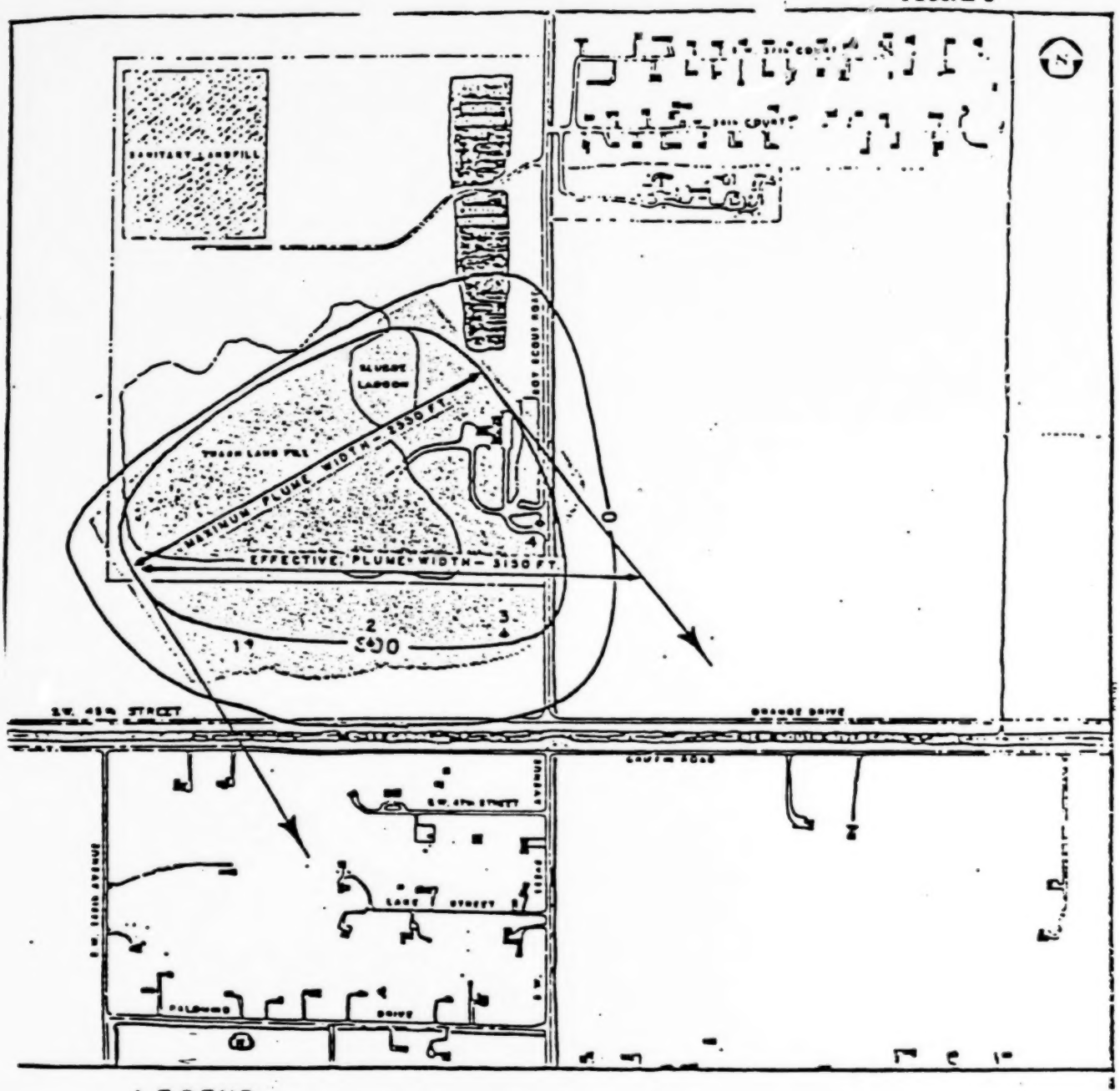
FIGURE 2



HAZEN AND SAWYER, P.C.
ENGINEERS

SLUDGE LAGOON LOCATION
BROWARD COUNTY LANDFILL

FIGURE 3



LEGEND

— 0 — EQUAL CHANGE IN TDS CONCENTRATION

1✦ INTERCEPTOR WELL

FUTURE PATH OF PLUME MOVEMENT

PLUME CAPTURE AREA

NOTE: MODIFIED FROM FIGURE 11 (CAMP DRESSER & McKEE, INC., 1981)

0 450 900 1350 Ft

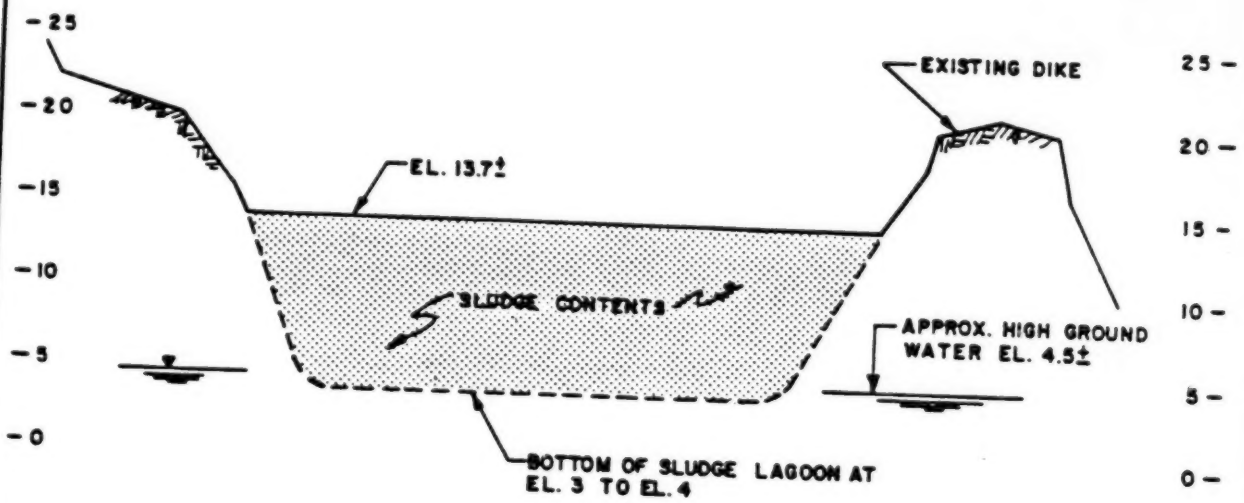
PREPARED FOR
HAZEN AND SAWYER, P.C.

TITLE
DAVIE LANDFILL

CHECKED BY T. TESSIER	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE JAN 84
DRAWN BY R. PADULA		REVISED
CHECKED BY T. TESSIER	SCALE SHOWN	SHEET 1

Reproduced from best available copy.

FIGURE 4



NOTE: ALL ELEVATIONS IN FEET

CROSS-SECTION SLUDGE LAGOON
BROWARD COUNTY LANDFILL

HAZEN AND SAWYER, P.C
ENGINEERS

-1-d

lagoon is reduced since discharge to the lagoon has ended. The lagoon now has a 1 to 2 foot crust over an approximately 9 foot total depth. It covers an area of 5.6 acres, half of which is overgrown, and contains approximately 75,000 yds.^{3} of waste.

CURRENT SITE STATUS

The site consist of a trash landfill, a sanitary landfill and a sludge lagoon. The area of concern under CERCLA is the 5.6 acre lagoon containing an estimated 75,000 cubic yards of sludge from grease trap and septic tank pump outs and treated municipal sludge (Figures 1,2,4). The pathway for contamination is via the groundwater to private wells which are downgradient of the site (Figure 3). The sludge lagoon contents have been sampled on three occasions. The initial sampling by EPA in August 1982 characterized the waste as being in the high range of typical wastewater treatment plant sludge hazardous constituents. Concern was raised about the relatively high cyanide and sulfide concentrations detected. A decision could not be made whether the waste was hazardous by characteristic (reactivity) according to RCRA since no definite criteria for this characteristic was available from RCRA. The waste was resampled by the County in July 1983. These samples showed reduced cyanide levels, but the number of samples was small. In May 1985 the lagoon contents were extensively sampled as part of a program to address the reactivity issue with a combination of treatment and management practices. Concurrent with this effort RCRA established some guidelines for reactivity. The sampling episodes, their results and the appropriate RCRA criteria are summarized below.

		Results mg/kg		RCRA Criteria for Reactivity mg/kg	
Date of Sampling	No. of Samples	Total Cyanides	Total Sulfides	Available Cyanides	Available Sulfides
8/82	5	101-303	170-3200	No criteria available at that time.	
7/83	4	2-67	———		
5/85	17	24-61	24-505	250	500

The testing was for total cyanides/sulfides and the criteria is for available cyanides/sulfides.

Groundwater has been monitored continually since 1976. Sampling shows a plume moving southeast in the direction of general groundwater movement. (Figure 3). This plume is believed to contain leachate from the trash and sanitary landfills as well as the sludge lagoon. The nearest receptors are private wells which are downgradient of the site. According to reports prepared by Broward County's consultant, these wells have not shown drinking water quality violations. This plume was modeled in 1981 and the results predicted that closing of the lagoon - and the substantial decrease in hydraulic loading - would result in a gradual improvement in water quality.

The county has recently installed 24 new monitor wells resulting in a total of 51 wells to track the quality of groundwater on and near the site.

ENFORCEMENT

The Broward County Solid Waste Disposal Facility is owned and operated by Broward County. The County is in the process of closing the facility. This closure must satisfy both Florida regulations and CERCLA concerns.

Broward County has conducted the studies to characterize the site and evaluate alternative remedies. Various regulatory agencies have provided guidance so that the studies can form the basis for this Record of Decision.

Broward County did not accept industrial waste discharges at this sludge lagoon. Septic tank pump-outs were accepted from industries as well as from other county residents. The relatively high cyanide and sulfide levels found in the sludge lagoon strongly suggest that industries were improperly discharging plating wastes to their septic tanks. Because of the County's stance against industrial discharges, their funding of the needed studies and the high likelihood of private industry sources for the cyanides and sulfides, we believe that Fund participation is appropriate for the lagoon source control action.

ALTERNATIVES EVALUATION - SOURCE CONTROL ONLY

Preventing contamination of the potable water supply is the primary public health objective. Prevention of further contamination of the Biscayne Aquifer is the primary environmental objective. These goals are essentially identical since the Biscayne Aquifer is the potable water supply.

There were 24 alternatives evaluated for the closure of the sludge lagoon. These alternatives can be divided into general categories according to the types of actions envisioned. Below is a listing of the alternatives by number and a description of the category.

Alternatives	Description
1, 2	Haul off-site to hazardous waste site in Alabama
3, 3A, 3B, 12, 20	Landfill unstabilized sludge
4, 5, 6, 7, 7A, 7B 8, 9, 10, 11	Landfill stabilized sludge
13, 14, 15	Incinerate
16, 17, 18, 19, 20A 21, 22, 23	Cap lagoon with additional remedial steps or combinations of the above alternatives
24	No Action (Monitor Groundwater)

The following table (A-1) provides a summary of the major features of the alternatives evaluated.

TABLE A-1

SUMMARY OF ALTERNATIVES

Alternative No.	Cover Lagoon	Disposal	Dewatering	Stabilization	Solidification	Incineration	Capping	Municipal Water Supply	Deep Well Injection
1	YES	ALABAMA							
2	YES	ALABAMA	ON SITE						
3	YES	NORTH REGION	ON SITE						
3A	YES	CELL #14	ON SITE						
3B	YES	CELL #14	ON SITE					YES	
4	YES	IN LAGOON	ON SITE	COMPOST				YES	
5	YES	ON SITE	ON SITE	COMPOST					
6	YES	NORTH REGION	ON SITE	COMPOST					
7	YES	ON SITE	ON SITE	LIME					
7A	YES	ON SITE		LIME					
7B	YES	ON SITE		LIME					
8	YES	ON SITE	ON SITE	CHLORINE					
9	YES	ON SITE	ON SITE	ANAEROBIC DIGESTION					
10	YES	ON SITE	ON SITE	AEROBIC DIGESTION					
11	YES	ON SITE			CHEMICAL				
12	YES	NORTH REGION	NORTH REGION						
13	YES	ON SITE				FLUIDIZED BED			
14	YES	ON SITE	ON SITE			FLUIDIZED BED			
15	YES	ON SITE	ON SITE			ROTARY KILN			
16		IN LAGOON					YES		
17		IN LAGOON					YES, FULL SLURRY WALL		
18		IN LAGOON					YES, HALF		
19		IN LAGOON					YES	YES	
20	YES	NORTH REGION					YES	YES	
20A		CELL #14		LIME			YES		
21	YES	IN LAGOON					YES		
22		IN LAGOON					YES		TOTAL FLOW
23		IN LAGOON					YES		PORTION OF FLOW
24				NO ACTION					

Alternatives were screened out for the following reasons:

- Alternative does not meet regulatory requirements
- Alternative has serious environmental liabilities
- Alternative has serious reliability or constructability liabilities
- Comparable technology exists at a lower cost

Alternatives were not permanently screened out on the basis of cost alone. Since there are over 12 viable alternatives with a present worth cost less than $5.5 million, those exceeding $5.5 million were set aside, but may be reconsidered later.

Following this narrative description of the screening of alternatives are tables summarizing the cost of alternatives and the screening results.

Alternatives 3, 3A, 3B, 12 and 20 - Landfill unstabilized sludge: The State of Florida DER will not allow unstabilized sludge from the lagoon to be placed in sanitary landfills. These alternatives are eliminated from further consideration.

Alternatives 1, 2 - Haul to hazardous waste receiving sites in Alabama: These alternatives are eliminated due to high cost ($6,000,000) but may be reconsidered later.

Alternatives 13, 14, 15 - Incineration of sludge lagoon contents: These alternatives are eliminated due to high cost and potential air pollution impacts.

Alternatives 4, 5, 6, 9 - Compost or anaerobic digestion of sludge lagoon contents: These alternatives are eliminated due to high cost to stabilize sludge, but may be reconsidered later.

Alternative 16 - Cap Lagoon: This option provides an impervious cover over the lagoon. Constituents will continue to leach out of the sludge lagoon during the consolidation process contributing to groundwater contamination. This is a partial solution but does not meet the full objectives outlined by EPA. Capping the lagoon and leaving the sludge contents intact will be considered when coupled with other remedial steps. Providing only the impervious cover over the sludge lagoon is rejected.

Alternative 17 - Deep Slurry Wall and Cap: Potenial leakage of contaminents from the sludge lagoon contents will continue into the drinking water aquifer at a reduced rate. Due to the continued groundwater contamination Broward County would incur a long term environmental liability. This alternative is rejected.

Alternative 8 - Chlorine: Chlorine stabilization is an accepted practice in South Florida. A by-product of this process is an increase in the total chlorinated organics both in the sludge and supernatant liquor. Chlorinated organics in groundwater is a major concern to the regulatory agencies. Lime stabilization is an equivalent stabilization practice, is less costly and has no potential environmental liabilities. Chlorine stabilization is rejected.

Alternative 10 - Aerobic Digestion: This is a proven technology but is 50 percent more costly than conventional lime stabilization. While aerobic digestion is eliminated due to cost, it may be reconsidered later.

Alternative 11 - Chemical Fixation: Chemical fixation meets the same objective as lime stabilization. The sludge lagoon contents are stabilized or fixed, removed from the lagoon and are placed in a secure environment. Chemical fixation is approximately 40 percent more costly than conventional lime stabilization. While chemical fixation is eliminated due to cost it may be reconsidered later.

Alternative 19 - Water System and Cap: Under this alternative the sludge lagoon contents would be left in place. An impervious cap would impede vertical flow passage through the sludge lagoon contents. Groundwater would continue to be contamminated due to leachate generated during the consolidation process and sludge contents in contact with the groundwater. Installing a municipal water system down gradient of the contaminated plume would provide public health protection to those residents. Broward County would be obligated to continue monitoring the contaminated plume for the next 20 to 30 years. Due to potential adverse changes in the characteristics of the contaminated plume with time or the passage of more stringent groundwater regulations, Broward County would have a long term environmental liability. Due to these concerns, this alternative is rejected.

PRESENT WORTH COST
and PROJECT CLASSIFICATION
BROWARD COUNTY SLUDGE LAGOON

ALTERNATIVE	DESCRIPTION	PRESENT WORTH COST (1)	ACCURACY ± PERCENT
	HAUL TO HAZARDOUS WASTESITE		
1	Cake & Liquid	$6,600,000	20%
2	Dewatered Cake	5,800,000	20
	LANDFILL UNSTABILIZED SLUDGE		
3	N. Broward	3,500,00	20%
3A	Cell 14	1,900,000	20
3B	Cell 14	3,200,000	20
12	N. Broward	2,150,000	15
20	N. Broward	3,300,000	15
	LANDFILL STABILIZED SLUDGE - CELL 14		
4	Composting	$5,700,000	25%
5	Composting	5,600,000	25
6	Composting	6,100,000	25
7	Lime	3,700,000	25
7A	Lime	2,900,000	25
7B	Lime	3,600,000	25
8	Chlorine	4,600,000	25
9	Anaerobic Dig.	6,200,000	25
10	Aerobic Dig.	4,500,000	25
11	Chem. Fixation	4,200,000	25
13	Incinerate	5,700,000	25
14	Incinerate	6,400,000	25
15	Incinerate	7,000,000	25

PRESENT WORTH COST
and PROJECT CLASSIFICATION
BROWARD COUNTY SLUDGE LAGOON

ALTERNATIVE	DESCRIPTION	PRESENT WORTH COST (1)	ACCURACY ± PERCENT
	CAP LAGOON WITH ADDITIONAL REMEDIAL STEPS		
16	Cap Lagoon	$1,100,000	10%
17	Deep Slurry Wall and Cap	6,800,000	20
18	Shallow Slurry Wall and Cap	1,900,000	20
19	Water System and Cap	2,400,000	10
20A	Water System, lime stab. and landfill	4,200,000	15
21	Intercept, Deep Well and Cap	4,800,000 (2)	15
22	Partial Intercept, Deep Well and Cap	3,400,000 (2)	15
23	Partial Intercept, Deep Well and Water System	5,800,000 (2)	15

(1) Present Worth Cost include 30-year O & M cost for Alternates 21 and 22. Only those O & M costs which have major cost impacts were identified in screening process. Groundwater monitoring and site maintenance cost are same "order of magnitude" due to the location of the existing trash landfill and sanitary landfills on the same site.

(2) Revised injection well cost relect new design criteria.

SUMMARY OF SCREENING OF ALTERNATIVES

ALTERNATIVE	DESCRIPTION	FURTHER CONSIDERATION	COMMENTS
	HAUL TO HAZARDOUS WASTE FACILITY		
1	Cake & Liquid	No*	Costs High, Transportation Risks
2	Dewatered Cake	No*	
	LANDFILL UNSTABILIZED SLUDGE		
3	N. Broward	No	Do not meet
3A	Cell 14	No	State Regulatory
3B	Cell 14	No	Requirements
12	N. Broward	No	
20	N. Broward	No	
	LANDFILL STABILIZED SLUDGE - CELL 14		
4	Composting	No*	High Cost to Stabilize Sludge
5	Composting	No*	
6	Composting	No*	
7	Lime	Yes	
7A	Lime	Yes	
7B	Lime	Yes	
8	Chlorine	No	Potential to create chlorinated compound and exacerbate ground water problem
9	Anaerobic Dig.	No	
10	Aerobic Dig.	No	50% higher than comparable technology
11	Chem. Fixation	No	40% higher than comparable technology
13	Incinerate	No	Costs high potential air pollution
14	Incinerate	No	
15	Incinerate	No	

* Set aside due to high cost. May be reconsidered later.

SUMMARY OF SCREENING OF ALTERNATIVES (cont.)

ALTERNATIVE	DESCRIPTION	FURTHER CONSIDERATION	COMMENTS
	CAP LAGOON WITH ADDITIONAL REMEDIAL STEPS		
16	Cap Lagoon	No	Insufficient by itself to meet objectives
17	Deep Slurry Wall and Cap	No	Engineering infeasibility
18	Shallow Slurry Wall and Cap	No	Potential leakage of contaminants
19	Water System and Cap	No	Does not meet objectives of protection of environment groundwater contamination still would occur
20A	Water System, lime stab, and landfill	Yes	
21	Intercept, Deep Well and Cap	Yes	
22	Partial Intercept, Deep Well and Cap	Yes	
23	Partial Intercept, Deep Well and Water System	Yes	
24	No Action (Monitor Groundwater)	Yes	Does not meet objectives

As a result of the screening process the following alternatives were available for more detailed evaluation:

- Lime stabilization of sludge lagoon contents and placement in sanitary landfill cell #14 (alternatives 7, 7A, 7B and 20A).

- Cap lagoon. Intercept contaminated groundwater and inject in a deep well for disposal (alternatives 21, 22 and 23).

Any of these alternatives has the potential of complying with other environmental laws.

Alternatives 7, 7A and 7B are the same except for the type of equipment used to excavate & transport the sludge. Alternative 20A is identical to 7A except for the addition of a municipal water supply for the area.

Alternatives 21, 22 and 23 all include leaving the lagoon in place with a cap to reduce infiltration. Alternative 21 includes interceptor wells to recover the plume. Alternative 22 only partially intercepts the plume. Alternative 23 partially intercepts the plume and provides an alternate water supply. All three are similar in that the recovered plume is disposed of in a deep well (Table A-2).

TABLE A-2

DETAILED EVALUATION OF ALTERNATIVES

SUMMARY OF DESIGN FEATURES

Number	Cost	Remove Lagoon	Cap Lagoon	Intercept Plume	Alternate Water Supply	Comments
7	3.7m	Yes	No	No	No	Identical, except for construction method employed
7A	2.9m	Yes	No	No	No	
7B	3.6m	Yes	No	No	No	
20A	4.2m	Yes	No	No	Yes	
21	4.8m	No	Yes	Yes	No	
22	3.4m	No	Yes	Partial	No	
23	5.8m	No	Yes	Partial	Yes	
24	75k/yr.	No	No	No	No	No Action (monitoring only)

RECOMMENDED ALTERNATIVE

In 40 CFR 300.68(j) the appropriate remedy is described as the cost-effective remedy (i.e. the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment).

In the detailed evaluation of alternatives the no-action alternative was rejected because it met none of the objectives. No further action would be taken to halt generation of contaminated groundwater. Public health would continue to be a risk. The Biscayne Aquifer (a sole source aquifer) would continue to be contaminated by infiltration through the unlined lagoon and by horizontal movement of the groundwater and subsequent contact with lagoon contents. Much of the lagoon contents are estimated to be greater than 90% liquid and thus generates leachate even if infiltration is controlled. Recent data indicates leachate is being generated with total arsenic as high as 19 times drinking water standards (990ug/l) and total lead as high as 15 times drinking water standards (810ug/l). Continued generation of such high concentrations of contaminants would have prolonged adverse effects on the use of the Biscayne Aquifer as a drinking water source.

Alternatives 21, 22, and 23 were rejected as limited groundwater containment measures. They have the advantage of interrupting all or part of the plume and alternative 23 provides an alternate water supply, thus providing short term public health protection. However, capping the lagoon does not prevent leachate generation and subsequent contamination of the aquifer. Even the most comprehensive pumping strategy does not guarantee long term protection.

Alternatives 7, 7A, 7B, and 20A all provide adequate protection of public health, welfare and the environment. They are technologically feasible and reliable. Alternative 20A provides an additional measure of protection - alternative water supply. Earlier Broward County reports indicated that residential wells were not endangered. However, recent sampling data indicates a higher potential for off site well contamination. The proposed groundwater assessment will resolve this apparent contradiction in reported data and recommend necessary remedies to further protect residential water supplies.

Alternatives 7, 7A and 7B are identical in their effect. They all eliminate the sludge lagoon as a source of continuing groundwater pollution. They differ only in the construction equipment and methods employed. The decision on which of these to implement is best made in remedial design.

In summary, EPA has determined that dewatering and stabilization of the sludge lagoon contents, placement in the single-lined sanitary landfill cell #14 and capping the cell is the appropriate source control remedy. This remedy is protective of public health, welfare and the environment. The sludge will be stabilized to reduce its reactivity potential. Cell #14 has a liner and a leachate collection system which will eliminate discharges to the groundwater. Capping of the cell will greatly minimize the amount of leachate to be handled and thus is a necessary and cost effective measure.

The estimated costs for this action are:

capital cost	$3 - 3.7m
O&M - annual	$100,000 - water monitoring security no site maintenance
total present worth	$5.5 - 6.0m
opportunity cost to County of lost cell #14 volume	$1.0m

CLEANUP GOALS

The primary pathway of concern is leaching to groundwater and transport via the groundwater to potable wells. The goal is to prevent potable water from exceeding the applicable drinking water standards or the cancer risk level corresponding to 1:1,000,000. We have modeled contaminant movement in the Biscayne Aquifer and established the following cleanup levels in soils as sufficient to avoid exceeding our goals in the water.

Contaminant	Recommended Residual Concentration
Lead	1,000 ppm
Chromium	25 ppm
Cadmium	25 ppm
Arsenic	2 ppm
Mercury	20 ppm

These levels will be reexamined in the remedial design to verify our calculations and address other contaminants as needed.

COMMUNITY RELATIONS

On August 15, 1985, a fact sheet was submitted to the Broward County Public Library Government Documents Section, Fort Lauderdale, Florida, which detailed alternatives for the Davie Landfill site. The fact sheet emphasized that this was not the time for a final decision and that all comments would be welcome on any alternative until September 19, 1985.

The Sludge Lagoon Closure Plan was made available for public comment on August 29, 1985. Copies of available documents were placed in the resposi-tory. The EPA Office of Public Affairs issued a press release as to the availability of the study report for public review and to announce that a public meeting would take place on August 29, 1985. Additionally, ads were placed in local newspapers notifying the public of the scheduled meeting.

The public meeting was held at the Broward County Public Library Auditorium in Fort Lauderdale, Florida, and was attended by representatives of EPA, Florida Department of Environmental Regulation (FDER), Broward County representatives and their consultants, the media and private citizens.

No major concerns or issues arose during the public meeting. Specific issues and responses can be found in the attached Responsiveness Summary.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

The site is neither in a flood plain nor a wetlands area. Leachate is currently transported by tank truck to a municipal waste water treatment plant. Future plans may include construction of a sewer line or spray irrigation. Should permits be necessary they will be secured. Because the sludge will be stabilized to reduce its reactivity and placed in a single lined landfill cell with a cap and a leachate collection system, this remedy will be consistent with other environmental laws. The implementation of the remedy is expected to release methane, hydrogen sulfide, ammonia and carbon dioxide from the sludge. Precautions will be taken with the workers and plans prepared to minimize the effect of odors on residential areas. The Clean Air Act does not address these compounds but Florida does have an odor nuisance provision in their regulations.

OPERATION AND MAINTENANCE (O&M)

Operation and maintenance will include:

- maintaining site drainage
- prevent erosion
- maintain grass cover
- site security
- groundwater monitoring
- disposal of leachate collected from cell #14

Maintenance and monitoring costs are expected to be approximately $100,000 per year. Over 20 years the County could incur an estimated $2,000,000 for these costs. Leachate disposal cost will vary greatly depending upon the final method of treatment. Over a 20 year period this could cost approximately $2 - 2.5 million. EPA does not generally share in O&M beyond one year. The State and County must assume the responsibility for future O&M.

SCHEDULE

Upon signing of this ROD negotiations will begin for design of the source control action. Concurrently we will prepare a work plan to assess the need for further groundwater remediation.

FUTURE ACTIONS

This ROD addresses only source control. The action described in this document will have a beneficial effect on groundwater quality in and around the site. The decision on additional action that may be necessary to address groundwater contamination will be made after an evaluation of the effects of

this action and further assessment of data from continued monitoring. We anticipate that the groundwater assessment will include:

TASK	PROJECTED COMPLETION
° an assessment of existing information	March 1986
° an inventory of private wells	March 1986
° monitoring of existing newly installed wells for a full range of analyses	March 1986
° verification of aquifer parameters	June 1986
° verification of predictive modeling of plume movement	June 1986
° analysis of historical and predicted groundwater gradients	July 1986
° sampling of selected offsite wells	June 1986
° verification of sampling & analytical procedures	March 1986

Community Relations Responsiveness Summary
Davie Landfill Site
Davie, Florida

Introduction

This responsiveness summary for the Davie Landfill Site documents, for the public record, concerns and issues raised during remedial planning; comments raised during the comment period on the feasibility study; and how EPA or the State considered and responded to these concerns.

Concerns Raised Prior to the Public Comment Period

The predominant concern voiced by members of the community was the potential health effects resulting from possible groundwater contamination emanating from the sludge lagoon. The Davie Landfill, also known as the Broward County Solid Waste Disposal Facility, is owned and operated by Broward County. The County had told the Town of Davie that the facility would be closed. However, according to a member of the community, the facility was not closed in the specified time frame. There is no record of what this specified time frame was. At present the facility is scheduled to close on December 31, 1987. The community's continuing concern is that the county's agreement to close the landfill be upheld. Twenty-five to thirty acres of the site are now covered with discarded automobile tires. The estimated 3 to 6 million tires pose a potential fire and health hazard, according to County officials. Citizens have complained about the increased mosquito population in the area. According to officials from the Broward County Public Health Unit, the mosquitoes are breeding in tires where rain water has collected. County health officials have stated that the mosquitoes pose a potential health hazard to people and livestock in the area. The County sprays the tire pile regularly with a mixture of diesel fuel and Baytex insecticide.

Concerns Raised During the Comment Period

Broward County has developed a closure plan for the landfill, including the sludge lagoon. This closure plan contains the same types of information that would have been obtained for a RI/FS report, and is therefore being used in place of the RI/FS. The results of the closure plan, a fact sheet, and sampling data were made available at the Broward County Public Library, Fort Lauderdale, Florida.

A public meeting was held on August 29, 1985, to explain the closure plan and to officially receive comments from the community. Two public notices were placed in the Sun Sentinel newspaper, and one notice in the Broward County Tribune/Hi-Riser, to inform the community of the date, time, and location of the public meeting. The 3-week public comment period began on August 29, 1985, and closed on September 20, 1985. Present at the

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COMMUNITY CONCERN	RESPONSE
1. Technical Alternatives	
A citizen asked how the contaminated groundwater will be intercepted under the plan of Alternative 2.	If alternative number 2 was the chosen alternative, recovery wells would be specifically designed to recover the contaminated groundwater. These wells would be larger than monitoring wells.
The same citizen asked if the primary objective of Alternative 2 was to prevent additional pollution after closure of the sludge lagoon.	No. Its purpose would be to intercept water in the plume.
2. Groundwater Monitoring	
A citizen asked what percentage of contaminated groundwater can be recovered under Alternative 2.	If cost were no object, most of it could be recovered.
3. Composting Methods	
A citizen asked what method of composting was studied for alternatives 4,5,6,& 9.	The method was the aerated pile method.
4. Meeting Location	
The former mayor of Cooper City stated that the meeting should have been held in the Town of Davie or in the Cooper City area. He suggested that in the future, informal meetings be held at the Davie Library. He felt that a larger number of concerned citizens will attend the meetings if they are held within the community and if proper notification of the meetings is given.	Comment noted.
5. Sludge Lagoon	
A citizen asked how long the sludge lagoon had been receiving waste, when did the lagoon open, and when did it close.	The sludge lagoon began accepting waste in November 1971. The sludge lagoon closed in 1981.

meeting were Jim Orban and Jewell Grubbs, EPA Superfund Program; Michael Henderson, EPA Community Relations Coordinator; Brent Hartsfield, Florida Department of Environmental Regulation Project Engineer; Jim Elias, Broward County Utilities Division; representatives of the consulting firms Hazen and Sawyer and Post Buckley, Schuh-Jernigan; 2 members of the news media; and 3 citizens.

When the remedy is selected, the EPA plans to enter into a cooperative agreement with the State of Florida Department of Environmental Regulation to design and implement the selected remedy. At that time, another public meeting will be held to inform the community of the course of action.

Several concerns were expressed by those attending the public meeting on August 29, 1985. The following pages summarize these concerns and the Agency's response.

Remaining Concerns

Community concerns will be taken into account during remedial design and construction. The community would like to see continued monitoring of the site for environmental problems after closure.